THE BRITISH JOURNAL OF PHOTOGRAPHY

Pocket

SPITTING FLASKS

Type [illegible], made in dark blue glass with rubber stopper.

Type [illegible] with [illegible] of [illegible] cap.

[illegible] of [illegible].

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THE BRITISH JOURNAL
OF
TUBERCULOSIS

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EDITORIAL

THE last issue gave a review of a short monograph on Infection and Environment in Tuberculosis, the work of Lissant Cox, Heaf, McDougall and Powell. It was a pithy and critical document. It surveyed the factors in tuberculosis morbidity; it pointed clearly to the reasons for our comparative failure to cope with them; and it showed the path, the only path, along which successful control of the disease was likely to be reached. There has now appeared a Report[1] by the Committee on Tuberculosis in War-Time, appointed in the autumn of last year by the Medical Research Council. Though it deals with the subject from an immediate point of view, it covers much the same ground; for, indeed, one cannot separate a short- from a long-term policy in such a matter if results are to follow. The committee have been more specialised in their survey and more detailed in their statistics, more sparing of criticism and more formal of guidance. But both reports carry conviction. It seems certain that their combined effect is likely to have far-reaching results upon general opinion, and thus upon measures for restricting future incidence and enlarging treatment of the disease.

The position in this country before the present war was roughly that a quarter of a million subjects were under supervision at dispensaries for recent or active disease, that about sixty-five thousand new cases were notified annually, and that about thirty thousand deaths a year occurred from tuberculosis in all its forms. Over half the deaths occurred in patients under forty-five; and between the ages of fifteen and twenty-four tuberculosis accounted for about half the total deaths from all causes, and for more than any other disease. The decline in death-rate of the pre-war years was arrested on the outbreak of war, and since then has been

[1] M.R.C. Special Report Series, No. 246. H.M. Stationery Office, London, 1942. Price 9d.

reversed. In 1940 there were 2,528 more deaths than in 1939, and in 1941 a further additional 516, mainly in non-respiratory forms. These figures apply to England and Wales, but in Scotland the trend has been the same, though more marked. For instance, in England and Wales the rise in the death-rate for respiratory tuberculosis is about 10 per cent.; in Scotland, 18 per cent.: for non-respiratory tuberculosis the figures are 21 and 28 per cent. respectively. For all forms in the three countries the rise is 13 per cent., or 3,780 actual deaths.

In 1941, though the additional mortality over 1940 was small, its distribution showed a disturbing feature, for it affected children in particular, and took the form of tuberculous meningitis. By then the death-rate from meningitis had risen since 1938-39 from a minimum of 34 per cent. for males in England and Wales to a maximum of 60 per cent. for females in Scotland. No comparable rise happened in the last war during the first two years; and, in fact, the committee point out that relatively the mortality position as a whole has retrogressed in this war twice as much as in the last. When it is realised that the main brunt of the increased incidence then came during the latter years of the war, we are left to ponder what is clearly an unsatisfactory situation.

The report is at some pains to discuss the reasons for this state of affairs, and gives a number of factors which are peculiar to the present war. It cites the evacuation of many tuberculosis hospitals and sanatoria in September 1939, the institution of black-out conditions, and overcrowding due to destruction of homes and evacuation of populations, especially children. These are in addition to circumstances which have operated during both wars: increased industrialisation, with all its added opportunities of infection, often in soil unprepared, excessive hours of work with inadequate rest and sleep, and often, too, inadequate meals.

On the score of nutrition the committee have found it impossible yet to relate the increased mortality in any definite way. Lack of first-class protein was thought to have played a part in the last war; but in this they clearly doubt whether it has been so important. Milk consumption they analyse in detail. During 1941 the average daily consumption of liquid milk was 0·53 pint and during 1939 0·43 pint, figures below the desirable limits of half a pint for adults, one to two pints for children and two pints for nursing and expectant mothers. For children, milk requirements have been met by priority supplies; yet it is among them that a good deal of the added mortality from tuberculosis has occurred. The key to the situation,

so far as a nutritional factor is concerned, may well rest, as the committee suggest, with the facts that practically all liquid milk in bulk is infected with the tubercle bacillus, that pasteurisation is still only partially in vogue in provincial towns and almost non-existent in rural areas, and that evacuation has led to a much greater number of children taking infected milk than was formerly the case. It is no wonder, then, that first among their recommendations they place an extension of pasteurisation of milk, with retention or recall of skilled workers in this field, and a simple warning that where milk is not pasteurised it should be boiled. Once again they find it necessary to urge this old advice, and to state in plain terms what the profession as a whole has thought for years: if all milk for human consumption were pasteurised or boiled, tuberculosis of bovine origin would be eliminated.

As expected, the report deals at length with mass radiography for early detection of the disease. Apparatus is in process of construction so that, by the end of twelve months, fifty sets will become available. The delay in providing apparatus on this scale is a matter for regret. But this is not the fault of the committee, who make suggestions for the way in which mass radiography should be used now that it is becoming more available. They consider this under the three headings of Pre-employment, Employment, and Periodic Mass Radiography. In the former they cite the three services; young adults, especially women, entering war industries; entrants to the silicosis industries; and young persons entering the potteries, as suitable for priority. Under employment schemes they regard munition workers as a proper class, especially in districts where it is known that the incidence of the disease is high, and where there is a concentration of war industries. Periodic radiography, they admit, is limited by war-time conditions; but, if it is feasible, they regard with priority employees in munition works and similar industries where there are large numbers of young adults, particularly young women, nurses and medical students, merchant seamen, and employees in any industrial concern where there has been an unusual number of cases of tuberculosis. These categories are certainly those with proper claims to such recognition.

The report then turns to consider the problems of dealing with those requiring treatment. It gives figures relating to the shortage of beds and of nursing and domestic staff. It gives recent waiting lists, and once again points out the fatuity of early diagnosis unaccompanied by facilities for immediate treatment. It suggests a survey of accommodation actually

usable, points out mildly that co-operation between local authorities might relieve the pressure, proposes increasing the number of tuberculosis beds at E.M.S. and municipal hospitals, and records that the attractions of the nursing profession might be displayed more cogently than they are. This part of the report is repetitive, as indeed it was bound to be, for every suggestion has already been made in many circles and on many occasions. It will do no harm to say the same again; but what is clearly wanted is a single directional policy. Those who have to cope with the problem of finding accommodation for waiting patients know very well that policy has been defective in this matter. On the score of shortage of staff there is also a criticism to be made: for a strong line at an earlier date in regard to reservation and training might well by now have eased a situation which was foreseen by most of those who treat the disease. And the report says nothing about the medical staffing of additional beds with men or women already trained in tuberculosis work.

A happier chapter in the report deals with the financial and industrial measures which the committee advise for the rehabilitation of the tuberculous, and for their support during and after treatment. There is a breadth and vision here which all who see the disastrous effects of the disease will gladly welcome. The recommendations of special financial provisions for as long as a year after notification, with review then if necessary, and of the provision of a fund for providing payments to supplement to their full amount the wages of those returning to their employment on the basis of part-time or modified work, are both wise and generous measures. The use of part-time workers industrially on a wider scale, and of special factory provision for modified work under conditions in which the risk of infection to others will be reduced to a minimum, are pressing needs; and the ways in which it ought to be possible to further these aims are outlined, with reference to the Fifth Report of the Employment Committee of the Joint Tuberculosis Council.

The report concludes with short sections dealing with general measures for raising the resistance to the disease, the examination of contacts, tuberculosis in mental hospitals, and propaganda; with the summary of findings and recommendations; and with an appendicular report by the technical sub-committee on apparatus for mass miniature radiography.

The main purpose of this report should be to provide Parliament and administrative authority with a concise statement of the views and recommendations of those who have to deal with tuberculosis problems. If it

fails to impress them with the unanimity of medical opinion or with the depth and gravity of the danger it will not be the fault of the profession nor of this committee. Fortunately there are signs already that it will succeed. No one is anxious to underestimate the tasks with which administrators are faced in these days, nor to offer criticism which is not fully founded in knowledge of their difficulties and the facts. We know well enough that they are assailed with a multitude of problems of which tuberculosis is one only, and not among war-time problems even a major one. But it is a major problem of health, and especially as regards the health of the most active and often of the most experienced members, upon which much of the capacity of the nation for protracted effort depends. It has for long absorbed the untiring efforts of many in the profession; perhaps it is not too much to hope that now it may claim the same from those who have the position and power to carry their wishes into effect.

C. H.

GENERAL ARTICLES

MALIGNANT ADENOMATOSIS (ALVEOLAR CELL TUMOUR) OF THE LUNG

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THE object of this paper is to record an instance of a rare tumour of the lungs. This is the so-called " alveolar cell " tumour, a characteristic growth thought to arise from lining cells of the alveoli. Its incidence and character have been reviewed recently by Neubuerger and Geever from the clinical and pathological aspects; and these authors list a total of thirty-five cases from the world literature, including in this number benign and " borderline " growths as well as those frankly malignant. Our own example shows a fine gradation histologically from benign " adenomatosis " to definite invasive carcinoma.

The patient in question was a man, 54 years old, a lorry-driver's mate, who when first seen in May of 1941 complained of a productive cough and shortness of breath. His symptoms already covered some eighteen months and had persisted steadily in spite of symptomatic treatment. The cough was described and noticed to have a paroxysmal character, and was at times severe enough to cause a good deal of distress. His sputum was consistently purulent, though never fœtid, and varied from 2 to 9 ounces a day in quantity, an amount which was not related to posture in any consistent way. Hæmoptysis was never a symptom. His shortness of breath appeared as a secondary symptom about eight months before he was seen; since then it had increased steadily until it was constant even at rest. In spite of these progressive pulmonary symptoms his general health had suffered little in comparison: he had lost some weight, but not much, and on a few occasions had night sweats; but his appetite, digestion and general activity had remained almost unimpaired. His previous health had been

PLATE XXIV

FIG. 1.

FIG. 2.

[To face page 158.

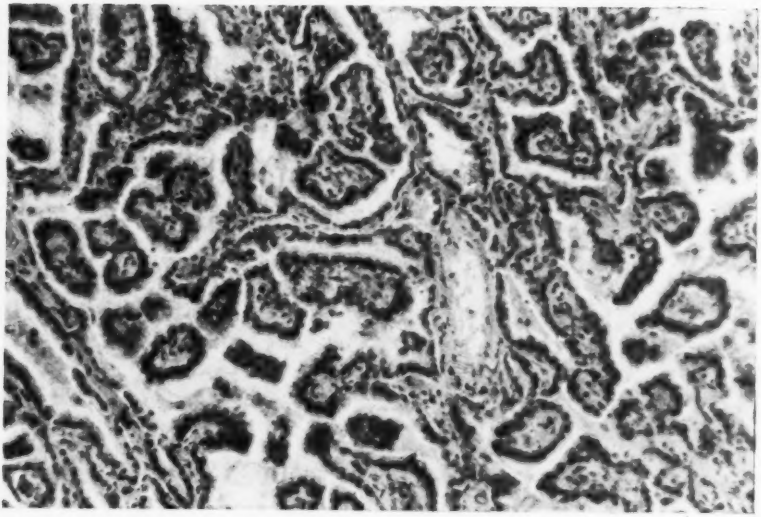

FIG. 3.—PAPILLARY "ADENOMATOSIS."
H and E. ×140.

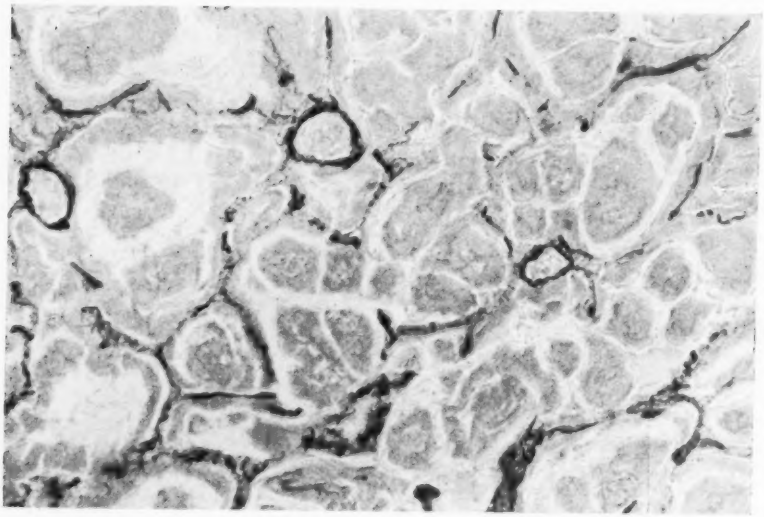

FIG. 4.—PAPILLARY "ADENOMATOSIS."
Weigert stain. ×140.

[*To face page* 159.

good and free from any illness affecting his chest. There was no history of contact with open phthisis, nor was there any history of illness in his family that might have been relevant to his own condition.

When admitted to hospital he was a spare active man, obviously short of breath even at rest in bed, and moderately cyanosed. His respiratory rate at rest ranged from 20 to 25 per minute, but rose quickly to over 30 if he was allowed up or undertook the slighest exertion. Clubbing of the fingers was a feature, but not in marked degree. His evening temperature reached 99·8° F. on a few occasions, but the diurnal variation was not more than a degree, and for the most part the range was normal throughout the day. Abnormal signs in his chest consisted of impaired movement of the lower half on both sides, myotatic irritability of both pectorals, impaired resonance over the lower third posteriorly on each side, prolonged expiration with scattered wheezing rhonchi especially on the right side, an area of bronchial breathing below the angle of the left scapula with bronchophony and whispering pectoriloquy as well, and many fine crackling râles heard over the bases of both lungs. Clinically his cardio-vascular system appeared to be normal apart from a simple tachycardia averaging 90 per minute; there were no arterial changes beyond those consistent with his age, his blood pressure was normal, the heart sounds also, unaccompanied by murmurs, and there was no evidence of cardiac enlargement or of failure. Elsewhere no abnormal physical signs were detected. A blood count at this time showed red blood cells 6,140,000 per c.mm., hæmoglobin 94 per cent. with a colour index of 0·77, and a leucocyte count of 6,200 per c.mm., of which 75·6 per cent. were polymorphs, 19·6 per cent. lymphocytes, 2·8 per cent. eosinophils, and 2 per cent. monocytes. Sputum was free from tubercle bacilli and from neoplastic cells; the predominant organisms were pneumococci at this time, although previously *Bact. friedländeri* had been the chief organism.

Radiographs of his chest (Figs. 1 and 2) showed considerable confluent opacities of fairly uniform density and with indefinite margins present in the lower halves of both lung fields, predominantly the left side. They were regarded as areas of confluent broncho-pneumonia of the type now familiar under the term "disseminated focal broncho-pneumonia." The radiographs also showed that there was no cardiac enlargement, nor any change in the appearance of the mediastinal structures. The bony structures of the thorax also appeared to be normal.

During the succeeding weeks the patient was treated symptomatically and allowed to be up for a short period each day. There was no material change in his clinical condition. His evening temperature rarely exceeded 99° F. and the pulse rate rarely fell below 90 per minute. A

further radiograph after an interval of four weeks showed more extensive opacities in both lower lobes, with translucent areas in places suggesting the presence of small abscess cavities, though no fluid levels could be discovered nor did a further leucocyte count reveal any increase in the total white cells. Postural drainage was started, but did not lead to any increase in the amount of sputum expectorated. Over the next two months his condition remained almost unaltered even as regards his weight; he had the same amount of purulent expectoration, the same degree of cyanosis and shortness of breath, and the same abnormal signs in the lungs themselves. But the lesions advanced steadily during this time, according to the radiological appearances, even though other things were so deceptive. By the middle of August the greater part of both lower lobes appeared to be involved, and it was noticed about this time that his cyanosis and dyspnœa had in fact increased. From then on the downward course was rapid, with increasing areas of bronchial breathing and clicking râles. Soon afterwards the pulse rate rose so that it was rarely below 100—often 110 per minute. Without any change in the degree of pyrexia or the amount of sputum he lost ground quickly; dyspnœa and cyanosis became extreme, and although oxygen administered with a B.L.B. mask gave him a little help, he became unconscious a few days later and died quietly the same evening.

Necropsy Report.—The body was that of a thin middle-aged man with much cyanosis and early clubbing of the fingers. The mouth, throat and œsophagus were normal. Both pleural cavities were more or less obliterated by adhesions over the lower and middle lobes of each lung, those over the lower lobes continuous with gross thickening of the visceral pleuræ. There was no hydrothorax. The trachea and bronchi contained a moderate quantity of muco-pus and showed chronic tracheitis and bronchitis. Both lungs were considerably heavier than normal. The right upper lobe was normal, but both lower lobes, the right middle lobe and the lingula of the left upper lobe were diffusely affected by a condition suggesting chronic confluent broncho-pneumonia. There were no abscesses, but the right lower lobe showed some areas of early suppurative changes.

The pericardium was normal and the heart also, excepting that the right ventricle showed a very moderate enlargement due to a combination of hypertrophy with dilatation. The naked-eye appearance of the myocardium was normal. There was no valvular abnormality. The aorta showed a moderate degree of atheromatous change. No abnormality was noted in the main coronary vessels.

The stomach and intestines were normal. The spleen was slightly enlarged from moderate congestion. The liver was also somewhat enlarged, congested and cyanotic in hue. Both kidneys also showed the appearance of

congestion, but no other abnormality. At the necropsy the tentative view was taken that death had been due to a terminal asphyxia with right-sided cardiac failure due to a chronic bilateral pneumonia.

A piece of lung and overlying pleura, $3 \times 3 \times 1\frac{1}{2}$ cm. approximately in size, was submitted for histological examination. This had a mottled greyish-white appearance to the naked eye, and was intersected by irregular thin lines and small blotches of carbon pigment. It had a solid feel and in general appearance was quite similar to a confluent broncho-pneumonia, and its true nature was not suspected until sections were examined. The pleura appeared slightly thickened.

The material was fixed in 4 per cent. formaldehyde saline and eight blocks were made from it and embedded in paraffin. Sections were cut at approximately 5μ and stained by Ehrlich's hæmatoxylin and eosin, Weigert's resorcin fuchsin, hæmatoxylin and van Gieson, and hæmatoxylin and mucicarmine.

*Histopathology of Lungs.**—The sections presented a striking appearance, nearly but not quite uniform throughout the material. The basic change was an epithelial proliferation within the existing alveolar structure (Figs. 3, 4 and 5). The alveolar walls with their capillaries and elastic tissue were intact and lined by a continuous layer of epithelial cells. Intra-alveolar papillæ were numerous. They consisted of a capillary loop with a minimum of supporting connective tissue covered by a tuft of epithelial cells. In the sections many of these papillæ, being cut in transverse section, appeared isolated within the alveoli. The covering cells were cuboidal or low columnar in type, those forming the papillæ being rather taller than the cells lining the alveoli; the nuclei were quite regular in size and were round or oval in the long axis of the cell, in height half to three-quarters of the total length of the cell and relatively basal in position. They were orthochromatic and moderately vesicular, with narrow but well-defined nuclear membranes, fine chromatin threads and small nodes, and each had a solitary inconspicuous nucleolus. Mitotic figures were very scarce. The cytoplasm was neutrophil and faintly granular, and typically contained no mucin.

In certain small areas there was a gradual transition towards a mucin secreting type of cell. These cells were taller with more basal nuclei; some of them contained globules of mucin and the alveolar spaces seemed to be distended with secretion (Fig. 6). Papillæ were less conspicuous, and where there was much secretion part or most of the epithelial lining was lost and the alveoli appeared as large irregular mucin containing spaces.

The above description applies to the great majority of the tissue, which

* The slides and photographs of this case were shown at a meeting of the Pathological Society of Great Britain and Ireland in March, 1942.

was thus considered to be histologically benign—a condition of papillary adenomatosis; the general regularity of arrangement without evidence of invasion, the scarcity of mitosis, and the fact that the epithelial proliferation was confined to a single layer of cells supported this view.

A further change was present in sections from one of the blocks: transformation to definite carcinoma (Fig. 7). Irregular spaces containing some mucin and partially filled with columnar or polygonal cells could be seen. These cells were larger than those previously described as lining alveoli and covering papillæ; they were more irregular in size with comparatively abundant degenerate cytoplasm, and often presented a distinctly squamoid appearance, but all transitions from a columnar form could be identified. Many cells were free or in small groups within alveoli. The nuclei, somewhat irregular in size and shape, were predominantly oval in the long axis of the cell, but isolated hyperchromatic giant forms were found. Mitosis was not infrequent. The tumour had excited a definite fibroblastic stromal reaction resulting in thickened alveolar walls. Part of the tissue was wholly necrotic.

Carcinomatous invasion of the pleura could be seen in sections from two of the blocks (Fig. 8), although the underlying lung at this point was free from overt carcinoma. Isolated columns of cells mostly secreting mucin could be made out, infiltrating within the vascular fibrous tissue of the pleura. The cell type was similar to that of the carcinomatous area within the lung parenchyma.

Throughout the material there was evidence of past infection. The pleura was thickened, up to 1 mm. in depth; numerous capillaries were present, embedded in moderately cellular fibrous tissue. Chronic inflammatory cells, plasma cells and lymphocytes were scattered throughout the pleura with occasional nodal collections of lymphocytes. Patches of carbon pigment were found in the deeper layers. Scattered throughout the lung parenchyma were a number of scarred areas. Bloodvessels and numerous closely packed coiled elastic fibres and fine threads of collagen indicated the sites of past infection; small collections of lymphocytes were also present. Many of the bronchioles contained numerous polymorphonuclears, and a few of these cells could be seen in adjacent alveolar spaces. The bronchiolar mucous membrane throughout the material examined appeared to be free from growth.

The histological findings in summary are thus: (1) Intra-alveolar papillary epithelial hyperplasia of the lung (adenomatosis) with transition to (2) mucin secreting carcinoma; (3) chronic inflammatory thickening of the pleura and focal scarring of the lung; (4) purulent bronchiolitis.

PLATE XXVI

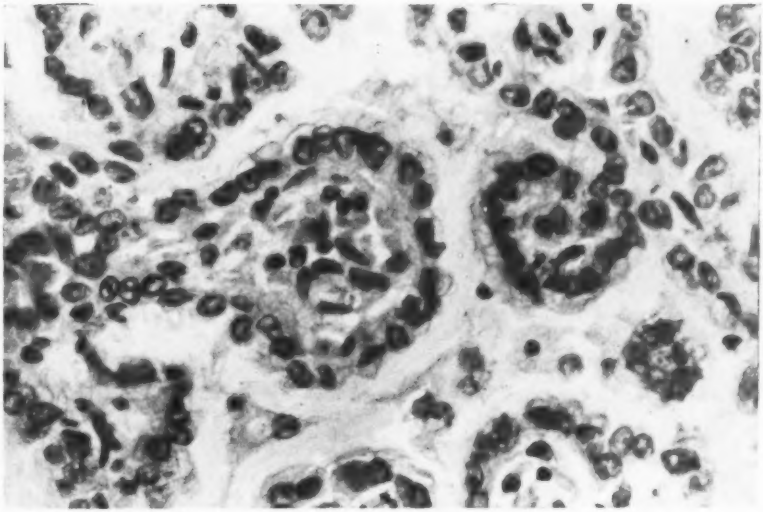

FIG. 5.—PAPILLARY "ADENOMATOSIS."
H and E. ×560.

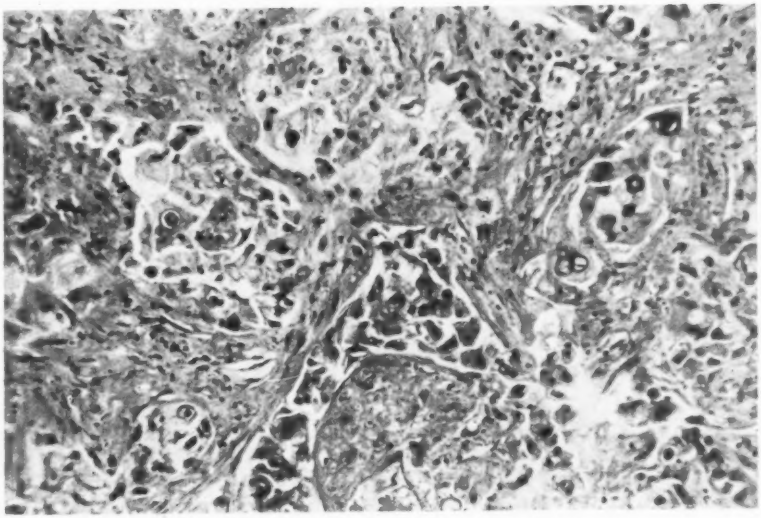

FIG. 6.—PAPILLARY CYSTADENOMATOUS AREA.
H and E. ×140.

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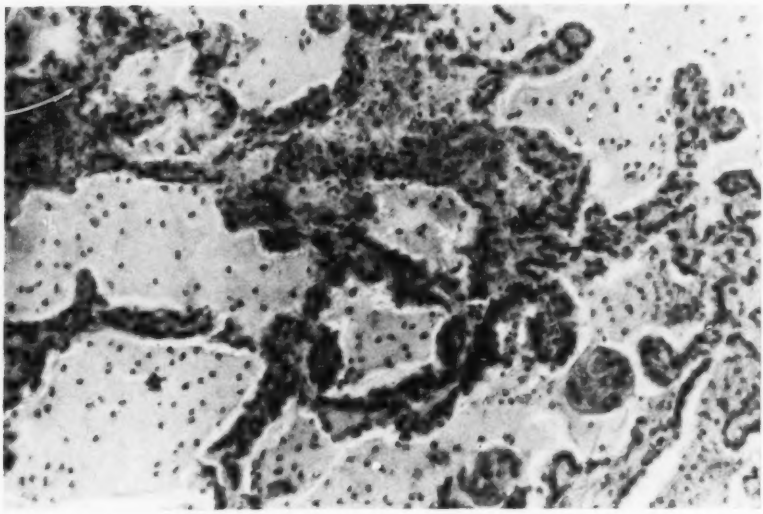

FIG. 7.—DEGENERATE CARCINOMATOUS AREA.
H and E. ×140.

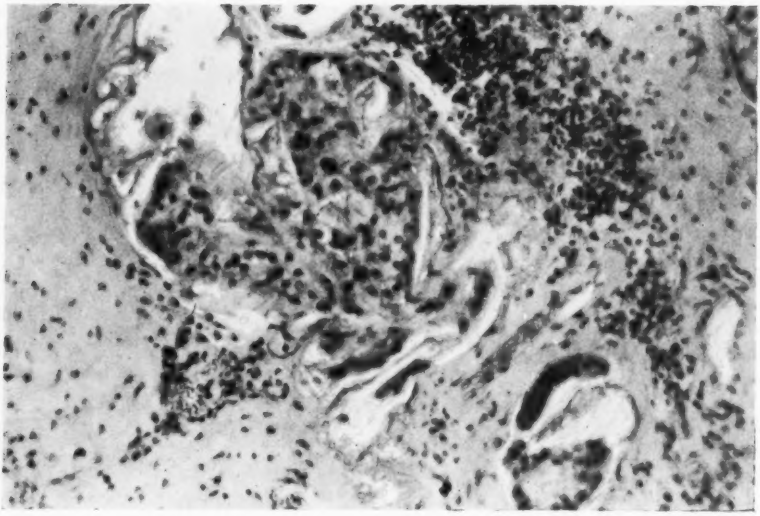

FIG. 8.—CARCINOMATOUS INVASION OF THE PLEURA.
H and E. ×500.

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Discussion

The clinical history, necropsy findings and histology of the lungs in our patient are in good agreement with the picture of " alveolar cell " tumours as detailed in Neubuerger and Geever's recent review. They regarded this type of tumour as rare, but not so rare as published reports would indicate. They found no distinctive clinical features; but the course of the disease is short, death occurring, usually, in less than one year from the onset, and amongst the chief features cough, hæmoptysis, cyanosis, pain in the chest and pleural effusions are prominent. The age incidence varies from 20 to 89 years, with a maximum incidence between 40 and 60 years; both sexes are equally affected. There are two morphological types of tumour: a multiple nodular type first described in 1876 by Malassez, and the less frequent diffuse type described later by Musser as involving a lobe or entire lung on one or both sides and resembling in naked-eye appearance the grey hepatisation of a pneumonic process.

Neubuerger and Geever found that metastasis was not a constant feature; and secondary deposits were present in about 50 per cent. of the cases which they reviewed; and in half of these they were localised to the hilar and bronchial glands. The other examples showed metastases in the liver, kidneys, brain, adrenals and pericardium, as well as in the lymph nodes.

The histopathology of the tumour they described as follows, both morphological types having an identical structure. The alveolar spaces are lined by cubical or columnar cells in one or more layers; papillæ are frequent, but the cells may be exfoliated and assume a rounded form or whole layers or sheets may be detached. The tumour cell nuclei are generally oval and pale with prominent pink nucleoli, but hyperchromatic nuclei or giant bizarre forms may be seen. Mitosis may be fairly frequent. Mucinous secretions are sometimes noted. The stroma of the tumour characteristically consists of the alveolar walls, which, however, sometimes show chronic inflammatory thickening with increase in elastic fibres; the alveoli may in this way be compressed and distorted; elsewhere dilated alveoli may fuse to form larger sacs. Tumour cells can occasionally be seen within lymphatics. The bronchioles are typically free from neoplastic changes.

Neubuerger and Geever listed twenty-five cases with gross and microscopical evidence of " alveolar cell " tumour and fifteen controversial cases of which six were accepted, and four others, histologically benign growths found accidentally at post-mortem (Björksten, Löhlein, Oberndorfer, Richardson), which they considered as possibly pre-carcinomatous.

These tumours are of peculiar interest not only on account of their

rarity and special form, but also because they appear to arise from the alveoli of the lung rather than by extension from the bronchioles or bronchi. The formation of a tumour clearly epithelial in character in such a site supports the contention that epithelial elements exist within the alveoli of the adult lung, a belief which is not by any means universally held.

The ætiology of the tumours is not known. Alveolar proliferation is frequently seen in or around diseased areas due to tuberculosis, pleuritis, silicosis, bronchiectasis and atelectasis, and is well marked in certain pneumonias of virus origin—*e.g.*, influenza and psittacosis. This proliferation is, however, not tumour formation and its relationship to true lung tumours has yet to be demonstrated.

Histologically this type of tumour closely resembles certain experimental and spontaneous tumours in animals: in mice the Tyzzer adenoma is a well-known type (see McDonald and Woodhouse); in guinea-pigs mucinous secreting tumours were noted by Spronck and Grumbach; and in horses by Theiler. Of greater interest than these from the point of view of ætiology, as pointed out by Bonne, is the close resemblance to pulmonary adenomatosis (Jaagsieckte) first described by Mitchell in 1915 as occurring in sheep.

The disease in sheep is known to be infectious and runs a chronic course after an insidious onset, a course which is characterised by progressive dyspnœa, a catarrhal exudate from the nose, cough, constitutional disability with eventual wasting though very little fever. The histological features of the lesions were well recorded by Cowdry (Fig. 9). There is a regular epithelial growth springing from the cells lining alveolar sacs, which may assume a papillomatous arrangement, and which arises quite independently of the bronchi judging from serial sections. The enlarged cells stain abnormally, the nucleus more intensely. The inter-alveolar connective tissue may show some increase with cellular accumulation but no special vascularity. Although the appearance of the lung resembles that of a tumour, mitoses are scarce and metastases are never found even in the hilar lymphatic glands.

The ætiology of this condition has remained obscure, though it is looked upon to-day as most probably of virus origin. Cowdry and Marsh thought it identical with the so-called Montana progressive pneumonia of sheep, and M'Fadyean with the verminous pneumonia of sheep. More recently Dungal and his colleagues described in detail an epidemic of the disease in sheep which was introduced into Iceland by a ram imported from Germany, and he first used the term "epizootic adenomatosis of the lungs" as a concise descriptive term.

Our own example taken from human pathology is, we believe, of unusual interest in showing transition to an infiltrating carcinoma from an intra-

FIG. 9.—ADENOMATOSIS OF LUNG OF AN ICELANDIC SHEEP. × 210.
(By courtesy of Dr. E. L. Taylor.)

[*To face page 164.*

alveolar epithelial hyperplasia or adenomatosis which on histological grounds may be considered benign. It thus provides a link in a chain of tumours which at one extreme are undoubtedly benign in structure and at the other undoubtedly malignant. In our case, although the bulk of the growth had every characteristic by which it would be entitled to be regarded as benign, by its sheer extent it killed the patient just as certainly as though it had been entirely malignant in character.

Summary

An example of malignant adenomatosis (alveolar cell tumour) of the lung is described occurring in a human subject. The literature is discussed and similarities to adenomatosis of sheep and some other animals are noted. These tumours appear to be true alveolar growths, and they show individually a series of stages from purely benign to highly malignant characteristics.

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HÆMATOGENOUS MALIGNANT DEPOSITS IN THE LUNG SIMULATING TUBERCULOSIS

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THE majority of malignant deposits in the lung, such as marble-shaped and "cannon-ball" tumours, are so typical in radiological appearance that little difficulty arises in their diagnosis. But there is one group in which the lungs are uniformly filled with metastases, and these cases are not uncommonly mistaken for acute tuberculosis. As we happen to have met several of these cases, it is felt that their description may be worth recording.

Cases

CASE 1.—Female, aged 36. Five years previous to admission this patient had a nervous breakdown, from which she never quite recovered. About twelve months before admission dyspnœa on exertion was noticed, followed a few months later by a dry, unproductive cough. At no time did she have any hæmoptysis. There was no family history of tuberculosis, though the patient had been in contact with a case some eight years before coming under observation. Examination of the chest showed signs of an effusion on the left side, but nothing abnormal was found in the other systems.

Chest X-Ray.—Right lung: Coarse mottling in all zones. Left lung: Appearances suggestive of pleural effusion with underlying mottling in the lung. *Bronchography:* Left lung: there was normal filling of the whole of the left bronchial tree, which was crowded by pleural compression. Right lung: normal. *Bronchoscopy:* No abnormality discovered. *Sputum* examination was negative for tubercle bacilli, and a guinea-pig inoculated from gastric lavage did not develop tuberculosis.

Examination of the *blood* revealed the presence of 12,000 leucocytes, but no other abnormality was found. A *diagnostic aspiration* failed to find any pleural fluid; but the pleura was felt to be hard and resistant.

When these investigations had been completed, it was considered that the patient was suffering from carcinomatosis and, as nothing further could be done for her, she was sent home.

CASE 2.—Female, aged 59. Five months previous to admission the patient developed a cough, which persisted and was followed a few months later by a pain in the back. There was no history of hæmoptysis.

PLATE XXIX

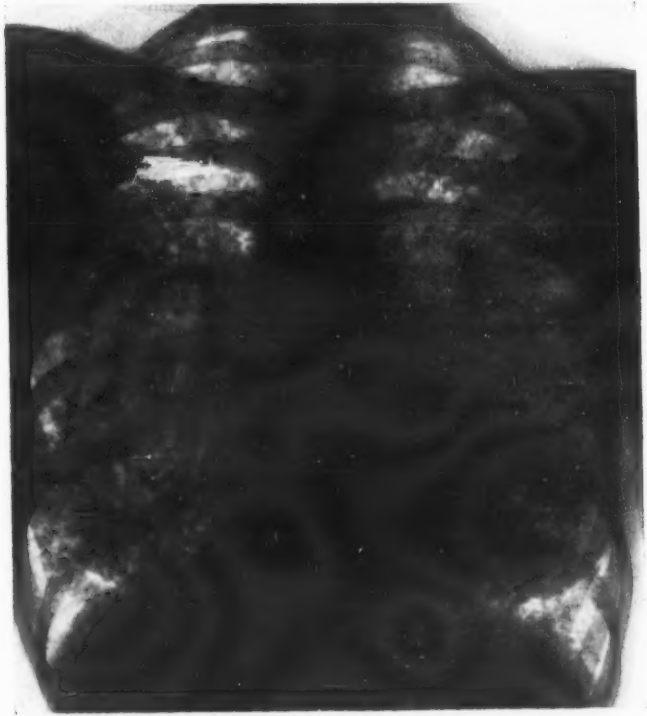

FIG. 1.—CASE 3 (X-RAY APPEARANCES IN CASE 6 VERY SIMILAR).

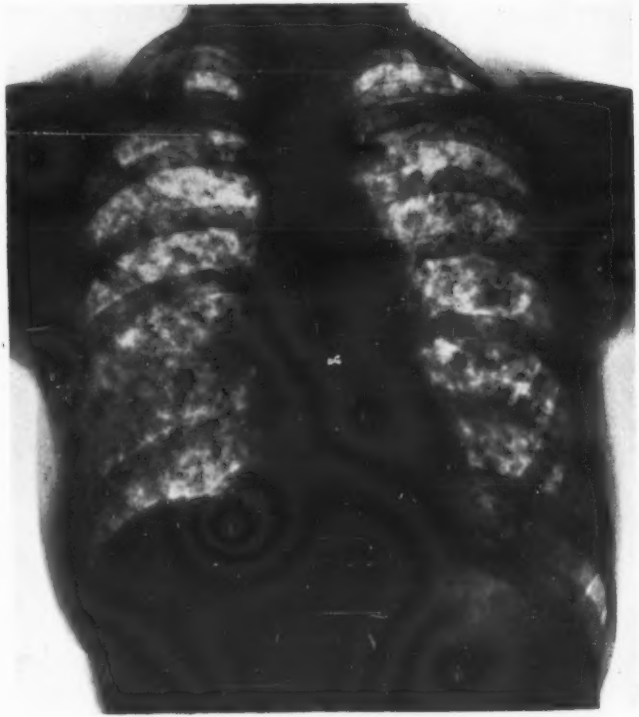

FIG. 2.—CASE 4.

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Clinically she showed signs of a left-sided effusion and the radiographic appearances were almost identical with those of Case 1. There was no sputum available for examination, and it was impossible to carry out any further investigation as the patient's relations took her home immediately it was learned that malignant disease was suspected.

CASE 3.—Female, aged 46. Six months prior to admission symptoms began with dyspnœa on exertion and pains in the chest. These were followed four months later by loss of weight, lassitude and cough; there was also a slight hæmoptysis about this time. In her family history the only point of note was a sister with a chronic cough, while in the patient's own history it was noted that a year earlier she had suffered shock from a bomb explosion.

Physical examination of the chest and other systems showed nothing abnormal, but two days after admission she complained of pain in the left side of the neck. Examination showed that the veins of the left arm and left side of the neck were distended and that there was cyanosis of the affected parts, together with some œdema above the left clavicle. These findings were consistent with obstruction of the left innominate vein.

Sputum was negative for tubercle bacilli on two occasions. The *blood sedimentation rate* was 13/200 in one hour. Radiographs showed an even mottling throughout both lung fields.

The patient died three weeks after admission.

At necropsy there were pleural adhesions over the right upper lobe, and an old tuberculous scar was found in the left upper lobe. Bilateral hydrothorax and hydropericardium were present. The lungs were permeated with malignant deposits throughout, but no primary growth could be found in the lungs.

The left innominate and internal jugular veins were filled with an organising thrombus. All the other organs were examined, but no primary growth was discovered. There were two uterine fibroids, but these did not appear to be malignant.

Pathological Report.—" Macroscopically both lungs were studded all over with deposits of tumour averaging about 5 mm. in diameter and leaving relatively little surviving lung tissue. The bronchi were searched for a primary, but none was found, nor did the distribution of the tumour suggest a primary in a bronchus. Similarly the relative lack of tumour in the root glands suggested a non-bronchial primary carcinoma.

" Histologically the tumour proved to be a well-differentiated adenocarcinoma of mucous-secreting type. Such a tumour is unlikely to arise in the bronchus. The commonest places for a primary of this type are breast and stomach, both of which are likely to show pulmonary metastases of the above type. The large intestine is an alternative, but in this case widespread metastases are very unusual."

CASE 4.—Female, aged 50. This patient gave a long history of indigestion, with more recently lassitude and an ache in the left side. She had also a dry cough and dyspnœa, but had not had hæmoptysis. A brother was said to have died from " galloping consumption," and another brother had

pulmonary symptoms. Examination of the chest showed nothing other than dulness and diminished air entry over the right upper lobe. In the abdomen there appeared to be a mass rather to the right of the umbilicus.

Chest X-ray showed absorption collapse of the proximal two-thirds of the right upper lobe. Studded throughout the remainder of the lung field were deposits suggestive of secondary growth.

Right bronchography showed complete obstruction of the right upper lobe bronchus. Radiographs of *pelvis and long bones* showed no evidence of metastases and a *barium meal* revealed no abnormality of the stomach.

Sputum was free from tubercle bacilli. The *blood sedimentation rate* was 29/200 in one hour.

The patient went home against advice, but an X-ray of her chest taken just before discharge showed that the collapse of the right upper lobe was then complete.

Case 5.—Female, aged 66. Six months before admission this patient was said to have had pleurisy and had not been well since. But there were no further definite symptoms until eight weeks before admission, when she developed a swelling of the right lower jaw. On examination it was found that she had a fluctuating swelling of the right mandible over which the skin was not inflamed. The fluctuation was also evident in the same region inside the mouth, but the mucous membrane was not broken and there was no especial tenderness. Physical examination of the chest showed some moist sounds at both apices.

Radiographs revealed loss of bone substance in the right mandible, suggesting invasion by tumour mass.

Both *lungs* showed fairly uniform mottling throughout.

Death occurred in hospital, but post-mortem examination was not carried out.

Case 6.—Male, aged 56. This man gave a history of severe pain in the chest and back during the previous few weeks. He had a cough and slight sputum, which on one occasion was streaked with blood. Examination of his chest and other systems showed nothing abnormal. *Sputum* was free from tubercle bacilli.

Radiographs showed diffuse mottling in all zones.

At necropsy the lungs showed malignant deposits similar to those in Case 3. The primary growth was a carcinoma of the pancreas.

Commentary

These six cases all present some interesting features, both collectively and individually. Five out of the six patients were females, and all were over 45 years of age, excepting one (Case 1, aged 36). This in itself is a very strong argument in favour of malignancy and against pulmonary tuberculosis.

Another important feature was that two only had a definite hæmoptysis. All of them had slight, but not very significant pyrexia along with a very modest rise in pulse and respiration rates.

Individually it will be noted that Cases 1 and 2, which are in most

respects similar, both exhibited a left-sided pleural opacity, which may have indicated that these were cases of pleural endothelioma with pulmonary metastases. In Case 3 the interesting features were the thrombosis in the innominate vein and the failure to discover the primary growth at autopsy. In Case 4 the primary growth was probably in the right upper lobe bronchus, but the mass in the epigastrium is difficult to explain.

In all of these cases a diagnosis of pulmonary tuberculosis was put forward initially, and in Case 5 the swelling in the jaw was originally regarded as a tuberculous abscess. The age of the patient, however, apart from other features, was against such a diagnosis, and it is probable that the mandibular lesion was an osteogenic sarcoma, in which circumstances the lung condition would be described as sarcomatosis. The radiographic appearances of the lungs in all these cases were, however, pathognomonic of hæmatogenous malignant metastases.

Summary

Six cases are described to illustrate the clinical and radiological features of diffuse hæmatogenous involvement of the lungs by secondary malignant growths. Confusion with acute phthisis is not uncommon; but the older age and infrequency of hæmoptysis, the relatively slight pyrexia, the radiological appearances in the lungs and sometimes evidence of a primary growth are distinctive features.

BRONCHIAL CARCINOMA WITH INFILTRATION OF THE LEFT AURICLE OF THE HEART

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The following case shows the progressive development of a bronchial carcinoma from its very early stage to a surprisingly extensive lesion, with infiltration of the left pulmonary vein and the left auricle of the heart.

The patient was a married European woman, 32 years old, who complained of cough. In January, 1939, a bout of pain on the left side of the chest had been diagnosed as "pleurisy." The pain was not severe and disappeared a few days later, but it recurred at intervals. Associated with it there had been a dry cough, most evident when she was lying flat. In May, 1941, cough became persistent and worse, and for the first time she

produced sputum which was streaked with blood. She was admitted to hospital in January, 1942.

At this time she had a cough with a small amount of mucoid sputum. She complained also of dyspnœa on exertion and fatigue. Her appetite was fair and loss in weight was negligible.

Her *previous medical history* was unimportant, and no *family history* of tuberculosis was elicited.

On admission her general condition was fair. She was a small, frail woman of nervous disposition, weighing 109 lbs. Her temperature ranged from 97° to 101°, pulse 98 to 120 at rest, and respiration 22 to 26. Her mucous membranes were of good colour; there was no clubbing of fingers and no glandular enlargement. There was no thyroid enlargement.

There was dulness at the base of left lung with increased vocal resonance, and bronchial breath sounds and whispering pectoriloquy over a limited area at the angle of the scapula posteriorly.

Sputum was free from tubercle bacilli on direct smear and on concentration; and hæmalum-eosin stain for malignant cells (Dudgeon's technique) was indefinite.

The *cardiovascular system* was normal excepting for a persistent sinus tachycardia. The abdomen was normal. A *blood count* showed: hæmoglobin, 85 per cent.; white blood cells total, 14,800 per c.mm.; diff.: polymorphs 70 per cent., eosinophils — per cent., lymphocytes 26 per cent., mononuclears 4 per cent. Blood sedimentation rate (Cutler, 1 hr.) 25 mm.

A blood film showed no evidence of a leuco-erythroblastic anæmia.

An electrocardiogram was normal. The basal metabolic rate was ×55 per cent. Blood cultures were sterile. Agglutination reactions were negative for typhoid and *Br. abortus*. The blood Wassermann was negative. A Casoni skin test was negative, and the Mantoux reaction was negative.

The first radiograph of the chest taken on March 7, 1941, showed a faint haziness at the left base; four months later (July 16, 1941) a further radiograph showed a "definite patch in the fifth space." On November 24, 1941, she was X-rayed at the King George V Hospital as an out-patient, and this showed a fairly extensive lesion at the left base. She was admitted to this hospital soon afterwards.

On January 10, 1942, an X-ray of the chest showed a slight increase in the size of the opacity in the left lung. This opacity on the antero-posterior X-ray appeared continuous with the left border of the heart and extending to the chest wall. On lateral radiographs the mass appeared irregularly rounded lying behind the heart and in the paravertebral gutter. The thoracic vertebræ showed no evidence of bony involvement.

A diagnostic left artificial pneumothorax was done and showed a limited area of collapse at the base with the opaque area adherent to the chest wall.

A tentative diagnosis of malignant disease of the left lung was made. Serial X-rays of the chest showed a rapid extension of the disease process in the left lung, and also a contralateral spread with cavitation in the right upper lobe with scattered infiltration throughout the rest of the right lung. This appeared as an unusual feature for malignancy.

PLATE XXX

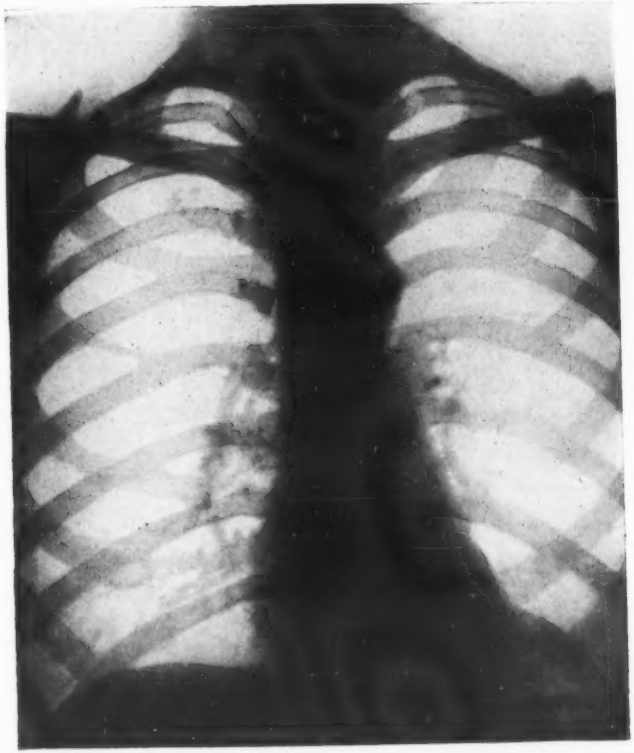

FIG. 1.—(7.3.41) RADIOGRAPH SHOWING FAINT HAZINESS AT LEFT BASE.

FIG. 2.—(27.1.42) RADIOGRAPH SHOWING A LIMITED LEFT BASAL PNEUMOTHORAX (DIAGNOSTIC) WITH INCREASE IN SIZE OF THE OPACITY AND CONTRALATERAL SPREAD, CHIEFLY IN THE UPPER LOBE.

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The patient's general condition showed a corresponding deterioration. She became more dyspnœic and showed peripheral cyanosis. Although the tumour was far advanced and beyond treatment, bronchoscopy was advised as being the only procedure by which a diagnosis could be made. A bronchoscopy was done, and during the process of passing the bronchoscope into the left main bronchus the patient suddenly died.

A post-mortem examination was done, and the following were the relevant findings:

Thorax.—On opening the thorax the right lung was found collapsed. Pleural adhesions were present at the apex and base. The left lung was grossly adherent.

Left Lung.—Pleura adherent. The lung was hard and airless and its surface irregular. On section almost the whole lung was found to be occupied by the tumour mass, which was friable in parts. There was no evidence of fibrous tissue formation. The tumour was traced laterally and found to infiltrate the left pulmonary vein, extending along its wall and lumen into the cavity of the left auricle of the heart, almost completely filling it.

Right Lung.—Collapsed. Similar infiltrations were found in the upper lobe with scattered tumour tissue in the base. Several hard nodules were found lying on the surface of the lung. These shelled out easily. There was no macroscopic evidence of glandular infiltration.

Heart.—There was a small pericardial effusion. The heart muscle was pale and flabby. The left auricle was almost completely filled with tumour mass. The mitral valve was very dilated, easily admitting three fingers. There was no evidence of infiltration of the valves of the heart.

Genito-Urinary System.—Kidneys congested. No sign of hypernephroma. No evidence of primary tumour in uterus and adnexa.

Alimentary System.—No evidence of a primary neoplasm in gastro-intestinal canal.

Report of Microscopic Section.—" This is a very cellular carcinoma with numerous mitotic figures. The structure corresponds to that of a carcinoma of the bronchus."

Discussion

This case illustrates the increasingly common problem of the early diagnosis of bronchial carcinoma. A limited number of patients with malignant disease of the lung can to-day be cured by operative treatment, and the clinician is faced with the decision of presenting the case early enough for surgical extirpation of the neoplasm.

This patient must be regarded as a medical failure. For about a year prior to her death she was under observation for a lesion at the left base, and when first seen was not suspected of having malignant disease. A bronchoscopic examination then might have been of great value, though the peripheral situation of the growth raises doubt whether even thoracotomy would have been decisive at this stage.

After admission to King George V Hospital a tentative diagnosis of pulmonary neoplasm was made. Several unusual features presented them-

selves. The fairly rapid contralateral spread with cavitation as seen on the X-ray and confirmed post-mortem was unusual in a primary bronchial carcinoma. The persistent tachycardia, in the absence of any obvious signs of toxæmia or cachexia, was probably due to interference with cardiac action by malignant infiltration along the wall and into the lumen of the left auricle. This and the gross pulmonary infiltration undoubtedly accounted for the peripheral cyanosis. A microscopic section of the tumour mass lying in the left auricle showed the same structure as that of the main neoplasm. In view of this invasion into the lumen of the auricle and the friability of the growth it is surprising that there was not more gross cardiac interference nor evidences of embolic phenomena.

The immediate cause of death was apparently a massive pulmonary collapse involving the right lung, due to the pressure of the bronchoscope on the right main bronchus during the bronchoscopic manipulation.

Summary

A case of bronchogenic carcinoma is recorded showing infiltration of the left pulmonary vein and left auricle of the heart.

We wish to thank Professor Ryrie of the Department of Pathology, University of Cape Town, for his report on the microscopic section.

"A CASE OF HÆMOPTYSIS"

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Recorded details of clinical cases are apt to resemble big-game stories; they may be "tall" and signify nothing, but the recounting of a personal experience is as stimulating to a doctor as it is to a fisherman, and with these thoughts in mind we present the following case. It is a reminder that long endeavour may bring its own reward.

In December, 1941, a girl aged seventeen was admitted to Horton Emergency Hospital. She was a bright, vivacious person and complained of repeated hæmoptyses.

The symptoms dated from February, 1940, until when her general health had been good. At the beginning there were two small hæmoptyses, and the cause of bleeding was neither sought nor treated. In January, 1941, the condition recurred and her doctor sent her to the North Middlesex Hospital for investigation. She was admitted to the hospital and, although no physical signs were discovered, an X-ray of the chest showed evidence of childhood tuberculosis, with a patch of recent but slight infiltration in the subapical part of the right lung. The patient had no cough or sputum, and was afebrile, but as a diagnosis of pulmonary tuberculosis seemed probable, she was transferred to Harefield Sanatorium. She remained under observation here for three months; since no further proof of tuberculosis was forthcoming, she was then discharged and began work as a domestic servant. In June, 1941, she developed pain in the right chest, and began to cough up blood again; she was admitted to Darvell Hall Sanatorium on July 30. The clinical condition at that time was as follows: In appearance she was anæmic, but in good general health; her weight was 8 st. 5 lbs., and there was no fever, cough or sputum. The signs in the chest were those of localised pleurisy in the right side and a small effusion was present. X-rays showed some recent infiltration in the right middle zone; the subapical shadows were unchanged. At this time there were repeated small hæmoptyses. In August, 1941, an artificial pneumothorax was attempted on the right side, but was unsuccessful. The sputum was very scanty and tubercle bacilli were not found. It was felt that the lesion in the chest was not of the type or extent to account satisfactorily for repeated hæmoptyses and so the patient was transferred to Victoria Park Hospital. Soon after admission there were two small hæmoptyses, but sputum was difficult to obtain and was again negative for tubercle bacilli. A bronchogram was made, and showed a normal bronchial tree. An attempt at bronchoscopy was not successful because of the unusual shape of the jaws and teeth. The patient was therefore sent back to Darvell Hall Sanatorium, and on her return the hæmoptyses not only became frequent, but increased in size on each occasion. A specimen of the blood was taken and sent in November, 1941, to Dr. Shera, who reported as follows: "Prothrombin index 64 : 4; platelets normal." Being at a loss to account for the bleeding, and still believing that the pulmonary condition did not offer a sound explanation, a course of vitamin K was given, orally and by intramuscular injections. This did not affect the course of events, and on December 12 the girl had a brisk hæmoptysis, followed on subsequent days by two further hæmorrhages in which she was estimated to have lost several pints of blood. A note was made of the fact that the blood "just came up"; its escape from the mouth was not associated with undue cough, and it was not mixed with gastric

juice or food. There was no clinical evidence to support a diagnosis of gastric ulcer, Banti's disease, or œsophageal varices.

Until the time of the massive hæmoptyses the general health of the patient had always been good, but she now began to suffer from the effects of blood loss. The B.S.R. at this time was 28 per cent. and there was a low irregular fever; a blood count showed 3,040,000 red cells and 50 per cent. hæmoglobin. In these circumstances a transfusion of 2 pints of blood was given. As she improved and bleeding stopped for the time being, it was then decided to transfer the girl to Horton for further investigation.

On admission the above history was obtained, and clinical examination revealed the following points: The general health and appearance of the patient were good, although she had lost 1½ stone in weight since the onset of her illness. She was apyrexial and without cough or sputum. The menstrual periods were normal, and with the exception of two ulcers on the palate, there were no abnormal signs in the chest or elsewhere. The ulcers were situated in the front of the palate, just behind the teeth; each was about ¾ inch by ¼ inch in extent, the edges were raised and somewhat indurated, and the base covered with a thin brownish slough and granulation tissue. They were painless, and there was no cervical adenitis. There was no other evidence of sepsis in the mouth, apart from one carious tooth, and the pharynx was normal. The patient stated that the ulcers had never caused trouble and had been present for several months.

Soon after admission there were several small hæmoptyses, for which morphia and injections of Congo red were given; during this period the palatal ulcers remained unchanged. The following investigations were done at this point:

1. Blood count: Red blood cells, 3,620,000; hæmoglobin, 60 per cent.; colour index, ·83; white blood cells, 9,600 per cubic millimetre.
2. Bleeding time was within normal limits.
3. Capillary fragility test was within normal limits.
4. Wassermann and Kahn reactions were negative on several occasions.
5. Repeated examinations of such sputum as could be obtained failed to show tubercle bacilli. No unusual organisms were found.
6. Gastric lavage was negative for tubercle bacilli.
7. Occult blood was present on one occasion in the stools, but tubercle bacilli were not found.
8. The Mantoux reaction was positive.
9. Radiographs of the chest showed a small shadow about the size of a 6d. in the outer part of the right upper lobe with two tiny shadows near it. This shadow had the appearance of an Assmann's focus. There were no other abnormalities and no evidence of hilar adenitis.

10. A smear made from the palatal ulcers gave a growth of many different organisms which consisted chiefly of Gram-negative long and short bacilli, and some Gram-positive cocci. No spirochætes were found.

11. A biopsy of the margin of one of the ulcers was reported as showing no evidence of syphilis, tuberculosis, fungus or parasitic disease. The section showed chronically inflamed granulation tissue.

12. The report of a skin specialist was that the ulcers were not syphilitic or tuberculous, but might be due to some fungus or yeast infection.

Meanwhile hæmoptyses continued. Inspection of the palate soon after a small attack of bleeding showed no change in the ulcers; the opinion was formed that they were not the source of the bleeding. The nose and throat were repeatedly examined and were not in any way abnormal.

One month after admission, and shortly after a small hæmoptysis, bronchoscopy was done; the bronchial tree and major bronchi were normal; no blood was seen.

A week later a course of N.A.B. and bismuth was started; it produced no effect upon the ulcers, and small hæmoptyses continued at intervals of several days. An attempt to induce an artificial pneumothorax on the right side failed.

A month passed without further incident, and then the patient suddenly coughed up 15 ounces of bright blood, and complained of severe pain in the right chest. There were no significant physical signs at this time, and an X-ray taken on the following day showed neither change in the lung fields, nor anything which might be construed as blood in the alveoli. The bleeding was again treated with injections of morphia and Congo red.

In the two months which followed the severity of the hæmoptyses increased; the X-rays and signs remained unchanged, and three further bronchoscopies and one œsophagoscopy were all negative.

With these facts and investigations at our disposal, the differential diagnosis was discussed. The opacity in the upper part of the right lung and the history of pleurisy spoke for tuberculosis, but the fact that the pulmonary lesion had remained stable for two years, and that tubercle bacilli had never been found, suggested that the bleeding was unlikely to have come from a tuberculous focus in the lung. We did not believe that the palatal ulcers could be the source of the hæmorrhage because their condition did not vary, except in so far as there were times when there was some redness and localised acute inflammation. It was therefore suggested that the pulmonary lesion might be a benign lung tumour such as a hæmangioma or perhaps a blood cyst, and although X-rays taken soon after a hæmoptysis failed to show blood in the alveoli, it was difficult to put forward any more plausible explanation of the facts. Syphilis of lung or

the trachea were considered, but were unlikely to be the cause because the Wassermann reaction was negative, there had been no response to anti-syphilitic treatment, and there was no ulceration of the trachea on bronchoscopy.

The necessity of undertaking some form of radical treatment became more apparent as the weeks went by, because the bleeding was assuming alarming proportions, and it was in these circumstances that lobectomy was decided upon. The patient agreed without hesitation to undergo the operation.

Six months after admission to Horton the upper and middle lobes of the right lung were removed under general anæsthesia. There were diffuse pleural adhesions and some enlarged hilar glands. The hilar structures were secured by dissection, and the bronchus closed with an intercostal pedicle graft. Removal of the middle lobe was carried out because no fissure could be found between it and the upper lobe. The pleural cavity was drained for thirty-six hours. The patient's convalescence was uneventful, and in three weeks she was able to get up; the remaining lower lobe had by this time almost completely filled the right chest. The part of the lung removed at operation was normal, excepting the area of the shadow seen in the X-rays, where there was a small circumscribed caseous mass with little or no perifocal reaction; the hilar glands contained typical small caseating foci. These findings were confirmed by microscopy.

During the first ten days after operation there were no hæmoptyses, *and the palatal ulcers healed for the first time.* On the eleventh day the patient had a small hæmoptysis of a few ounces, and one of the ulcers was found to have reappeared. The blood which had been coughed up was sent to the laboratory for investigation, and was reported as containing blood and saliva, but no polymorphs.

The diagnosis was now clear. The ulcers were self-inflicted, and the bleeding came from the rich vascular plexus of the anterior palatine arteries. Having pricked the palate, the mouth was kept closed until it had filled with blood and the superficial appearances of hæmoptysis were produced in this way. The matter was fully discussed with the patient, after which the fresh ulcer healed, and she was discharged from hospital without symptoms as soon as suitable occupation had been found.

The key to the story lies in her life history before the symptoms started. It was obtained from the Probation Officer. She was an illegitimate child whose father died, and whose mother married later. Frightened of her step-father and unhappy at home, she ran away as a young girl, and lived in a poor lodging-house. Here she met a Hindu seaman, who always treated her kindly and by whom she became pregnant at the age of fifteen. A

miscarriage followed, and the girl came under the care of the Probation Officer, who found her work and lodgings, but the Court refused to give consent to marriage at that time. She worked then as a domestic servant, but life was unsatisfactory to her, and the fact that her one friend had gone away to sea provided a series of circumstances which appeared insoluble. It was at this time that she first began to have " hæmoptyses," and being an astute person, the observations she made in sanatoria and hospitals enabled her to play the part of a patient with active tuberculosis, and to get sympathy and attention for two and a half years.

We hope that her future may be more happy, and that the responsible employment in which she is now engaged may help to correct her difficulties.

CHRONIC MILIARY TUBERCULOSIS

CASE REPORT

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Introduction

Chronic miliary tuberculosis has been recognised for nearly a century, but prior to the general use of radiography it remained almost entirely a pathological curiosity. That it is not invariably fatal was averred by Waller (1845), and Wunderlich (1860) maintained that he often saw evidences of chronic miliary tuberculosis while making necropsies. Burkhart (1873) described instances of miliary tuberculosis in which the character of the tubercles furnished evidence that they had existed for a considerable period before death; and in two instances the lungs, as well as other organs, contained numerous encapsulated nodules which had undergone calcification. Many other authors have recorded similar observations, among them Longcope (1906), who in a study of nineteen cases of miliary tuberculosis found eight in which the course of the disease was sufficiently prolonged to be considered subacute or chronic.

At first, most of these cases were recorded mainly by radiologists, but of late clinicians have reported numerous instances. Cohn (1921), Rist (1927), Blaine (1924), Marlow (1929), and Hein (1930) have reported cases which either ran a chronic course or healed entirely. Hoyle and Vaizey (1937), in an excellent monograph, reviewed a total series of a hundred and twenty cases, including ten of their own.

The present case shows many interesting clinical and radiographic features illustrative of the condition. The patient has been observed over a period of four years and has made a striking recovery from the disease.

Case Report

A girl, aged 16, was referred for suspected pulmonary tuberculosis by a local practitioner on July 19, 1938. He stated she was anæmic and had a cough and dyspnœa, but he had not been able to find any definite physical signs of tuberculous disease in the lungs. The duration of the illness was about two months. She came of healthy stock and had always been well except for scarlet fever and diphtheria in childhood.

I saw her on July 21, when her chief complaint was of cough and tiredness. Examination of the chest revealed a few scattered râles, but there was no suggestion of any active focus of tuberculosis in the lungs. There was some tachycardia. A fairly large mass of glands was readily discernible in the right supraclavicular region and was found on palpation to be discrete, mobile and painless.

A skiagram of the chest on July 26, 1938, showed a fairly coarse miliary mottling of both lung fields with markedly enlarged mediastinal shadows, presumably due to glands (Fig. 1). The diagnosis was doubtful, but as she began to lose weight fairly rapidly and showed evidence of increasing dyspnœa, she was admitted to Kilwinning Sanatorium for observation on August 22, 1938. A further skiagram of her chest then showed that the mottling of the lung fields had decreased in intensity and that the mediastinal shadows were not quite so pronounced. Further X-ray examination on October 18, 1938, showed a very marked change; there was another seeding of the lung fields and the mediastinal shadows had again become much more pronounced. X-ray examination was repeated at intervals till her discharge from the sanatorium on July 8, 1939. By December, 1938, the mottling had decreased in intensity and mediastinal enlargement was less conspicuous; but subsequent films showed very dense mottling and large mediastinal shadows once again. During sanatorium observation, however, there was a marked improvement in her general condition and she increased in weight from 6 st. 9 lbs. to 8 st. 7 lbs.

Sputum was always scanty and repeated examinations revealed no tubercle bacilli. The Von Pirquet test was also negative. Examination of blood revealed no evidence of any marked anæmia, the blood count being: erythrocytes 4,710,000 per c.mm.; hæmoglobin 89 per cent.; colour index 9·95 per cent.; leucocytes 10,700 per c.mm.; neutrophils 65 per cent.; eosinophils 2·8 per cent.; lymphocytes 25·6 per cent.; large mononuclears 6·4 per cent.; basophils 0·2 per cent.

She was treated by complete rest in bed and a course of sanocrysin to a total of 4·85 gms. during the period September to December, 1938.

The glands in the neck became smaller and more discrete, but no biopsy was done at this time. This was done, however, in February, 1940, by Mr. Bruce Dick, and the following report was made by the pathologist, Dr. Gilbert Millar of the Victoria Infirmary, Glasgow: " Glands are largely replaced by tuberculous caseous matter with early calcification. In most

PLATE XXXI

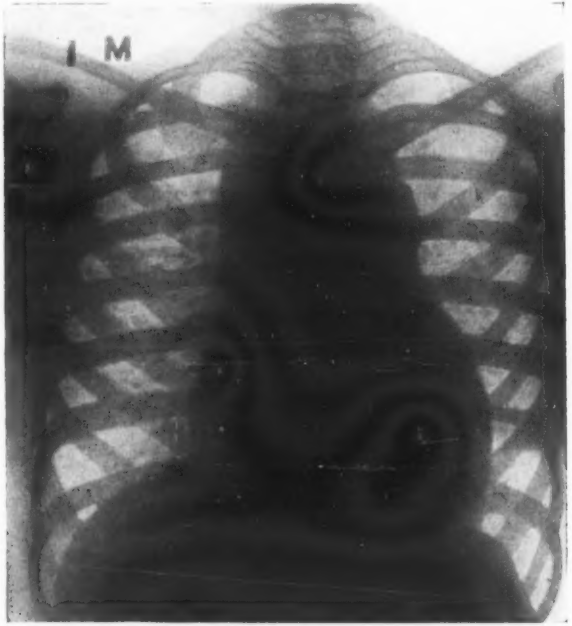

FIG. 1.—JULY, 1938.

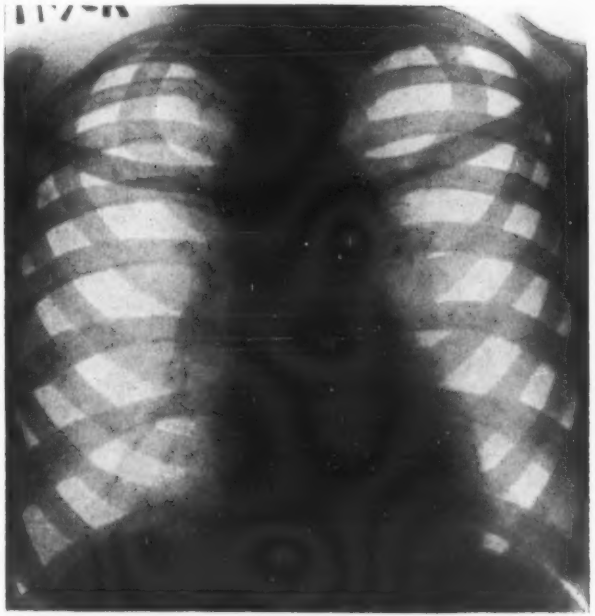

FIG. 2.—FEBRUARY, 1942.

(*To face page 178.*

instances the infection is well walled off by films of tissue and is obsolescent, with only an odd active follicle outside. One gland is in rather an early stage, there being a well-resisted fibro-caseous tuberculosis which is still active."

The patient returned to work in 1941, and since then has been in regular and constant employment as a clerk. Clinical and radiological examination in February, 1942, revealed no evidence of any disease in the lungs (Fig. 2). Her weight was 8 st. 13 lbs. and she looked well and felt very fit.

Comment

Fishberg (1932) refers to the fact that some authors, because of permanent recoveries, have cast some doubt over the authenticity of the stipplings as representing miliary tuberculosis on the roentgen film. However, there has been ample necropsy control to carry conviction.

The diagnosis of the condition during life, however, is not always easy. In this patient the distinction from lymphadenoma, and also from sarcoidosis of Boeck in their miliary forms, turned upon the discovery that the glands removed from the neck were tuberculous.

I wish to thank the County Radiologist, Dr. Irvine, for the radiographs.

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OBITUARY

FREDERICK GEORGE CHANDLER

AN APPRECIATION

The fatal illness of Dr. Chandler came as a deep shock to his close friends and colleagues. But many more for long will feel his loss, for he had gained not only the respect but the personal esteem of a wide circle within the profession.

Frederick George Chandler was born in Sutton, Surrey, in July, 1885. From the Leys School he entered Jesus College, Cambridge, with a scholarship, and gained first-class honours in the Natural Science Tripos in 1908. Thereafter he entered Bart's, taking his medical qualification with the

Conjoint Diplomas in 1911, and the M.B., Ch.B. degrees a year later. After house and registrar appointments he served as a regimental medical officer, and later as a medical specialist, during the war. In 1917 his thesis for the Doctorate won the Horton-Smith Prize; and after the war years the Membership of the Royal College of Physicians was taken in 1919. Soon after that he was elected to the visiting staff of Victoria Park Hospital, and a year or two later to the post of Assistant Physician and Medical Tutor at Charing Cross Hospital.

In these appointments Chandler served with distinction, and soon became known as a progressive and sound opinion. In 1925 he was elected to the Fellowship of the College. He entered the special field of chest diseases with a wide general equipment of medical knowledge; he saw clearly the need for more and better methods of investigation and treatment; and he added not a little to the advances which have taken place since then. He was one of the first to study, in this country, the problems of bronchography, and his monograph, written with Dr. Burton Wood, is a concise and sound appraisal of a method then not more than in its infancy. He realised to the full the many pitfalls which bestride the path of those treated by artificial pneumothorax; and he took an active part himself in the investigations by thoracoscopy which have gradually developed the safe section of pleural adhesions. Chandler had the capacity for attention to detail, the power of prolonged application, and the wisdom not to expect miracles, which mark those who make solid and enduring contributions to medical knowledge. When he wrote it was with a sure pen, and he was always easy to read. As recently as our last issue he gave a brief account of a few patients whom he had treated conservatively for tuberculous pyopneumothorax over many years. This paper, so typical of his style, made few general claims, no considerable deductions: it was a simple record of observed fact. At times his views were thought reversionary; but it was almost always his regard for under statement rather than the views themselves which produced such opinion. When he differed from others he usually held an unassailable position, for he always kept within the evidence. This type of mind with its freedom from bias, the judicial rather than the advocatory mind, is rare in most walks of life; it is rare also among medical men, for their urgency to seek and claim advance is all the greater as they deal with the most precious of human commodities. But Chandler knew the danger of claiming too much; and whenever he allowed himself the luxury of generalisation he did so with reserve. The work such men do almost always lives after them. Had his lot fallen where he might have devoted these gifts in greater measure to research there would, without doubt, have been a far longer story to tell of his success in this arena; but it would have been at the cost of

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depriving many who were his patients of the skill and guidance of unstinted help.

For Chandler was, indeed, one of those rare men whose desire to serve those with whom they come into professional relationship becomes almost an obsession. His thought for his patients was immense; no trouble was ever too great, no request too exacting. He set us all a standard in this matter, for he was essentially a man of immense sympathy and generous nature. What added so much to the effectiveness of these qualities was his patent honesty of purpose. One had only to be with him for a few moments on a case to realise the strength of character which he possessed. We must all, at one time or another, have experienced the patient or relative who combines, with an almost sinister ability, the maximum desire for sucking his doctor dry with the minimum regard for the victim. Most of us, too, can recognise the breed and are sufficiently impervious; but with Chandler, clearly as he saw the occasion, he was at heart too kind to restore the balance in his favour, though he could be deeply hurt by such conduct. Like all to whom personal conduct is a matter for continuous review, he had something of the sensitiveness of the artist in this, as in other things.

Chandler continued at Charing Cross until about twelve years ago, when he was appointed to the medical staff of his old hospital, St. Bartholomew's. There he served until his death, and will be sadly mourned. He was coming to the time of life when ripe experience means much to the councils of medicine; and those who knew him also knew how generously the profession might have expected to benefit from his common sense and honesty. Chandler was never a medical politician; he never trod the paths of intrigue, and he had the disdain of the sincere mind for the laurels of easy applause. He never played to the gallery; and if he happened to find himself the focus of interest he took a modest and retiring pleasure. But he never tried to seek advantage for himself from the chance of situation or from the work of others. All the more we shall regret his loss; for such men are needed in days of changing standards.

Though we shall miss his personal character and ability, and the wisdom he would surely have brought to the future, we shall also miss something more: his wide and deep culture. For he was a man who tempered knowledge of his own subject with learning of that of others. Outside medicine he had numerous interests, and his classical inclination never left him. We hear much doubt to-day about the value of classical education: Chandler was a living example of the charm and philosophy which it gives to the doctor. And he was, in this sense as well as others, in the line of direct descent from those who have brought to English medicine some of its most distinctive qualities.

C. H.

MEETINGS OF SOCIETIES

JOINT TUBERCULOSIS COUNCIL

A MEETING of the Council was held on Saturday, September 19, 1942, at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C.1.

Present.—Dr. James Watt (Chairman), Drs. J. C. Bridge, H. J. Burrows, G. Lissant Cox, Peter W. Edwards, Norman England, J. Ferguson, A. P. Ford, J. C. Gilchrist, F. R. G. Heaf, L. E. Houghton, G. Jessel, Mr. J. E. H. Roberts, N. Lloyd Rusby, D. P. Sutherland, Norman F. Smith, Professor W. H. Tytler, N. Tattersall, H. G. Trayer, E. Ward, R. A. Young and the Hon. Secretary.

Correspondence.—(*a*) Apologies for absence were received from Drs. P. Kerley, V. Ryan, W. T. Munro, Wing-Commandre R. R. Trail, Drs. D. P. Powell, A. Sandison and G. B. Dixon.

The Chairman expressed the sympathy of the Council with Dr. D. A. Powell, and the Hon. Secretary was instructed to convey to Dr. Powell the sincere wishes of the Council for his speedy recovery.

A warm welcome was given to Dr. Burrows, representing the Orthopædic Association, and to Dr. Ford, representing the British Medical Association.

(*b*) A letter was read from the Secretary of the Tuberculosis Association to the effect that Dr. A. S. Hall had been nominated to the Joint Tuberculosis Council vice Dr. Hebert, who has resigned the Presidency of the Tuberculosis Association.

Hospital Morbidity Statistics.—Dr. Heaf, Convener, reported on the meeting which representatives of the Joint Council had with Dr. Robb-Smith to discuss details concerning the tuberculosis morbidity statistics. Dr. Heaf informed the meeting that complete and full discussion had taken place, and that Dr. D. Robb-Smith, on behalf of his department, had conveyed thanks to the Council for their co-operation in this matter.

Radiology.—The Convener of the Radiology Committee, Dr. Jessel, outlined the procedure which had been followed in the preparation of the report on Miniature Mass Radiography. The report was considered paragraph by paragraph and some questions were raised on such points as the distribution of individual sets, the portability of sets, the utilisation of the apparatus in factories, and on the groups of workers—*e.g.*, merchant seamen and students—who would be subject to special investigation. An informal discussion on the question of compensation for tuberculosis was

raised. Dr. R. A. Young stressed once more the necessity for regarding X-ray examinations as an integral part of medical examinations as a whole, and all members were unanimous in expressing the opinion that individuals must not get the impression that one negative radiogram is proof of immunity from tuberculosis for all time. The Council did not feel that it was possible as yet to estimate with any degree of accuracy the number of beds which should be available for new cases discovered by mass methods of investigation.

The need for central administration was emphasised from all sides, and the only point on which there was any real difference of opinion was on the question as to who should read the small films—*i.e.*, whether it should be by one of a panel of clinicians or a radiographer. The main recommendations of the report are incorporated below:

1. Mass radiography should be treated as part of a general health survey and not related in the public mind specifically with tuberculosis.

2. It would neither be desirable nor generally possible for mass radiography to be carried out at existing tuberculosis dispensaries, but tuberculosis officers should take an active part in reading the films and investigating the suspects.

3. A central committee approved by the Ministry of Health with a medical adviser should be established to co-ordinate and supervise mass radiography.

4. Mass radiography sets should be lent to selected county and county borough councils after an approved scheme has been submitted by the medical officer of health and tuberculosis officer.

5. The sets should be established in centres convenient to large numbers of workpeople and moved to other premises from time to time for the examination of further batches.

6. Suitable groups for examination are: (i) Government and local government staffs, including civil defence personnel, post office employees, police, fire brigade, etc. (ii) Workers in munition works and other industries, particularly those known to provide an undue proportion of cases of tuberculosis. (iii) Secondary school leavers.

7. The following age groups should receive special attention: 16-30 years.

8. The staff employed in mass radiography should receive some central training.

9. The small films should be read by one of a panel of clinicians (including the local tuberculosis officer and radiologist).

10. Suspicious films should lead to a full-size skiagram being taken at the mass radiography centre or elsewhere.

11. This, if suspicious, would in turn lead to a full investigation at the local tuberculosis dispensary or general hospital.

12. Additional institutional accommodation would be necessary for the cases of tuberculosis discovered.

The report was adopted and it was agreed that the thanks of the Council be extended to Dr. Jessel and his Committee for a valuable contribution to the subject. The committee was invited to remain in office and to report if necessary from time to time, and full permission was given for the report to be used for propaganda purposes in the scheme about to be launched.

Arising out of this subject, a letter was read from the Secretary of the N.A.P.T. asking for guidance as to the method to be adopted in dealing with doubtful cases discovered in these radiological surveys. As this appeared to be a question of notification, it was decided to refer this letter to the committee dealing with this subject (Dr. Tattersall, Convener).

Report of Chairman on Meeting of Delegates from the N.A.P.T., the T.A. and the J.T.C. to discuss Amalgamation.—The Chairman outlined the events leading up to the present position. He explained that the draft proposals from the N.A.P.T. had been discussed at one meeting, which had, however, been preceded by a statement by Dr. Hebert, the President of the T.A., and which was taken by the N.A.P.T. delegates to cast some doubt on the desire of the T.A. to proceed further with discussions. Dr. Watt mentioned that the election of members to the N.A.P.T. Council was likely to prove a stumbling block, for there was a sincere desire felt by N.A.P.T. members that nothing should be done to alienate the co-operation of lay members on the Council. The Secretary of the N.A.P.T. asked for the views of the J.T.C. on the question of co-operation, and the Secretary was instructed to inform the National Association that our attitude had not changed and that we were prepared to proceed with negotiations. Mr. J. E. H. Roberts, the new Acting President of the T.A., stated that at a meeting of the Council of the T.A. held on September 18, 1942, there appeared to be some alteration in the attitude of members of the T.A. and that a special report has been asked for from delegates, but members of the T.A. Council present were of the opinion that there was not any " change of heart " on this subject and that they were anxious to proceed to explore the situation further.

Committee on Industrial Health in Factories.—Dr. G. Lissant Cox, in referring to the report of the Committee on Industrial Health in Factories, as a general question, asked whether the tuberculosis service was doing as much as possible for the industrial health in factories. He instanced the limitation of powers of the Ministry of Health and also the fact that there are only two industrial medical officers for every million workers in factories. Medical appointments are in the hands of industrial management.

Dr. Bridges, observer to the Ministry of Health, pointed out that in addition to medical officers there were a large number of technical experts available.

No discussion followed and the Council decided to take no further action at present.

Nursing and Domestic Staff Shortage in Institutions.—The Hon. Secretary reported on the deputation of the delegates from the N.A.P.T., the T.A., the J.T.C. and the Society of Medical Officers of Health to the Ministry of Health in July, 1942. All the salient points which had been discussed at previous meetings had been brought to the notice of the Ministry and the Ministry agreed that the position was serious.

Dr. Trayer emphasised once more the acute shortage of domestics, and various members commented on the valuable assistance which had resulted from the temporary transfer of probationers from general hospitals for a short period of training in sanatoria. The Chairman, Dr. Watt, said that this matter was still engaging the attention of the Tuberculosis in War Time Committee and that this Committee would be referring to the matter again in a subsequent report which would be laid before the Council.

Arising out of this matter, the Council agreed to a request from the T.A. to allow the Nursing Committee of the J.T.C. to co-operate with a special sub-committee of the T.A. in investigating the whole position of tuberculosis nursing with particular reference to the future of the service and the status of the Tuberculosis Association's Certificate.

Date and Place of Next Meeting.—It was agreed that the next meeting of the Council should be held on Saturday, November 21, at 10 a.m., in London.

REVIEWS OF BOOKS

The Fifty-Seventh Annual Medical Report of the Trudeau Sanatorium, together with the Twenty-Fifth Collection of the Studies of the Edward L. Trudeau Foundation. 1941.

In an attempt to find a satisfactory method of producing intrapleural adhesions Hanrahan, Adams and Klopstock, using dogs, rabbits, guinea-pigs and goats, tried the effects of a variety of substances. Three main groups of experiments are reported: (1) Open thoracotomy with such additions as gauze swabbing or pleural cauterisation. (2) Extrapleural injections of a glycerine-iodine solution. (3) Intrapleural insufflation or injection of such articles as talc, iodised talc, india ink, etc. The experimental animals were killed at intervals and the fate of the experimental material

determined. The most significant finding was the marked accumulation of particulate matter (talc, carbon) in the draining lymph glands associated with lymphatic obstruction. Particulate matter with an irritant action, such as iodised talc and india ink injected intrapleurally, proved the most effective.

The experiments are open to the criticism that different animals were employed for different articles; the most effective method of producing lateral parieto-visceral adhesions (the desire of the thoracic surgeon) was found to be the intrapleural injection of india ink in goats, but these animals were not used in any of the other experiments. Animal idiosyncrasy probably plays a very important part under these circumstances, so that these experiments require further amplification.

Heise in a paper on " Constitution and Diet in Tuberculosis " attractively displays evidence, both direct and indirect, of the part played by inheritance in the resistance or susceptibility to tuberculosis. In human surveys so many factors play a part that conclusions drawn, unless overwhelmingly obvious and beyond the laws of chance, are open to criticism. The part played by diet in modifying resistance is likewise analysed, both from historical and experimental aspects. Here the evidence is stronger, but even so multiple factors again tend to vitiate the conclusions drawn. It appears certain, however, that the greater attention paid to dietetics to-day is contributing to the reduction in the incidence of tuberculosis.

Other articles appear on an improved technique for the culture of tubercle bacilli (Sheenken and Smith); a tray for the staining of smears for tubercle bacilli (Sheenken); on the isolation of purified protein derivatives and carbohydrates from tuberculins and their biological properties (Sheenkin); on a case of pulmonary tuberculosis with genito-urinary tuberculosis (Herse and Sheenken); and on the growth and virulence of tubercle bacilli under varying circumstances (Herse and Sheenken).

Altogether this volume contains an enlightening and interesting collection of papers on a variety of subjects of interest to the worker in tuberculosis.

Annual Report of the Saranac Laboratory for the Study of Tuberculosis of the Edward L. Trudeau Foundation. 1941.

This report includes an introduction by the director (Leroy U. Gardner) outlining investigational work performed during the year, as well as that to be done during the ensuing year. Particularly interesting will be the work done on the effect of aluminium hydroxide on the development of silicotic lesions. The report is followed by reprints of three papers produced by the staff.

Louis H. Berkelhamer describes a method of tissue analysis by X-ray diffraction and its application to research problems in pneumokoniosis. Although not applicable to all cases, depending on the percentage of dust present, it has the advantage over dust retrieval that the latter is not altered during the process of extraction.

Leroy U. Gardner *et alia* report experimental work on guinea-pigs exposed to a mixture of sagger clay containing aluminium hydroxide and

50 per cent. silica. None of the animals showed evidence of silicosis after twelve months. The report is not final and further pertinent investigations are being carried out.

Arthur J. Vorwald, in a paper on " Cavities in the Silicotic Lung," comes to the conclusion that there are three main types: (*a*) Cavities associated with typical tuberculosis that is little modified by co-existent silicosis. (*b*) Cavities occurring in areas of tuberculo-silicosis. These are extremely chronic and seem to result from a combination of the effects of the tubercle bacillus and silica dust. (*c*) Cavities of the " anæmic type " occurring in areas of massive fibrosis. The characteristics and behaviour of these three common types of cavity are fully discussed.

War Injuries of the Chest. Edited by H. Morriston Davies, M.Ch., F.R.C.S.; and Robert Coope, M.D., F.R.C.P. Edinburgh: E. and S. Livingstone, 1942. Price 6s.

This compact volume of some 130 pages fitting easily into the coat pocket has been produced by the members of the Liverpool and North-Western Regional Chest Unit in an attempt to bridge the gap between the scattered articles on traumatic chest surgery and the larger volumes on chest surgery in general. It is primarily intended for the surgeon in the casualty clearing station or the first-line hospital.

The need for a book of this type is obvious, and its appearance is long overdue. Chest surgery has made strides since the last war. Much has been written about experiences in the last war and their application to this, a very different, war; a few articles of much more value have appeared on experiences gained in this war. Unfortunately, no group of men have yet seen sufficient cases during this war to enable them to write finally on the subject, so that much that concerns the management of chest injuries is still under discussion. The reader should bear these facts in mind and realise that this book makes no claim " to be authoritative or necessarily accepted by the E.M.S. Chest Units as a whole."

When examining the chest, the authors rightly lay stress on the employment of a few basic physical signs. The presence of vesicular breath sounds, dulness or resonance on percussion, the position of the mediastinum, and the presence of surgical emphysema are the most reliable, most easily elicited, and are not vitiated by other factors. " The absence or diminution of breath sounds is of little practical help . . . for in any injury the affected side of the chest may hardly expand, so that normal respiratory sounds are not heard."

The recommended delay in radiography until resuscitation is complete seems unwise if primary operations are to be practised successfully. Radiographers trained in chest work can carry out their task with no disturbance to the patient; there seems nothing to lose and everything to gain by radiography once resuscitation has been commenced. Adequate radiographs are essential in planning the necessity for and scope of operative procedures, and the sooner these are procured the better. X-rays in the antero-posterior and lateral planes are rightly stressed, but no mention is made of the value

of penetrating films in the location of foreign bodies, especially when there is fluid or where the foreign body is behind the heart shadow.

In their section on hæmothorax the authors might well have made a clearer distinction between a " simple " hæmothorax which forms the most important aspect of the case and a " complicated " hæmothorax occurring as a mere incident in a more serious injury. For the first group non-operative measures are required, whilst the latter cases are frequently in urgent need of surgical treatment. The only indications for operative treatment mentioned are those with progressive bleeding or massive clotting. No account is taken of those cases of complicated hæmothorax where a retained foreign body, or lung and chest wall damage, calls for operative treatment.

The authors lay great stress on the early and complete removal of blood from the pleural cavity. With this, most workers in the field will agree, though the use of air replacement and saline washouts does not meet with universal approval. The reviewer considers that complete removal of a large hæmothorax at one session is too formidable a procedure, whilst the employment of general anæsthesia in an already ill patient is unwise.

The difficulties attached to the early diagnosis of infection in a hæmothorax are well outlined; exploration with a needle is the only method of obtaining definite evidence of infection. The authors could well have included a paragraph on the difficulties of exploration due to such conditions as loculation, shreds of fibrin, etc. Treatment by aspiration, closed and open drainage are outlined and the indications for each mentioned.

Penetrating and open wounds of the chest are discussed and an account given of their effects. The indications for and technique of major surgical procedures are outlined. No distinction has been made between what one may term simple and complicated thoraco-abdominal wounds. " Wounds involving both the abdomen and the thorax have a grave prognosis," and " the severe degree of shock which is always present " obviously only refers to the latter group. The former (comprising nearly half of a series of cases seen in this war) are most frequently caused by relatively small missiles, have little early or late disturbance, and respond well to expectant treatment. The book concludes with short sections on anæsthesia and after-care.

A great deal of traumatic chest surgery is still under consideration and many subjects discussed here are of a highly controversial nature. In these circumstances it is extremely difficult to give the front-line surgeon just what he wants—a short, clear and authoritative account of the management of the chest case. There is more than a doubt in the reviewer's mind whether this volume supplies the need.

MASS MINIATURE RADIOGRAPHY OF THE LUNGS—III

FOR successful radiological interpretation of an enlarged projected image, definition must be of a high order.

DEFINITION or sharpness of image, depends on

a. Focal spot width.
b. Exposure time relative to motion in subject
c. Ratio of plane-screen distance to focus-screen distance.
d. Rigidity of apparatus, particularly X-ray tube mounting.
e. Grain, or crystal size, of fluorescent screen
f. Clarity of fluorescent image, or contrast.
g. Quality of photographic objective.
h. Resolving power of photographic emulsion.

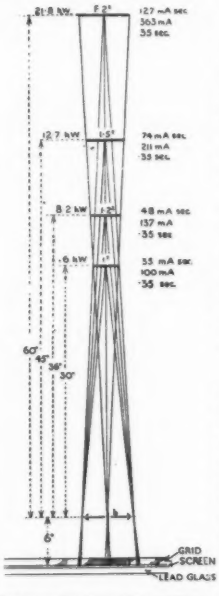

Diagram showing relative power required with various foci for comparable definition and equal exposure times. Reference a, b, c.

Focal spot size should be the smallest obtainable; 1 mm.² being the most practicable

Exposure time is subject to the ability of the tube to withstand continuously repeated exposures (120 per hour is desirable)

Since there are losses in speed compared with direct radiography, it is essential to keep the focus-screen distance at a minimum, usually not less than twice the longer dimension of the screen.

Under conditions of excessive contrast uneven X-ray intensity may become obvious unless the tube is so arranged that the attenuation is from top to bottom of the screen and not from side to side. The anode end of the tube should preferably be opposite the lower part of the screen, the denser areas (apices) then receive the greater intensity, and both lung areas are symmetrically exposed.

While maximum tube loading can be used for occasional screen photography, it is not economical to use it for *mass* radiography, since the rated capacity will soon be exceeded. Increase in the size of the focus does not help if satisfactory definition is to be maintained, because the extra power made available is offset by the increased focus-screen distance necessary, exposure times are the same. If cooling efficiency is the same in each case, a greater number of exposures per hour can be made with the finer focus tube. In any case the tube must be of the rotating anode type, then the capacity does not increase as to the square of the increase in focus width.

Particular attention must be given to the stability of the X-ray tube mounting when using such a fine focus, since the effective focal width can easily be trebled by a slight lateral vibration, to which fixed height systems of positioning are less prone.

Exposure time being a dominant factor, it follows that the fluorescent screen must have the highest possible luminosity consistent with a minimum grain and afterglow. *The Levy-West Mark 39 (yellow-green)* screen is considered as being highly suitable for this work. Under conditions of adequate contrast, isolated lines 1/50 in. diameter are distinctly resolved on the screen and in the miniature negative. Where there is lack of contrast due to over or under-exposure, or the prevalence of scattered X-rays or light, definition will be inferior. Experience indicates that it is better to ensure the maximum of contrast in the fluorescent image by the use of a stationary grid than to correct it photographically, or by the use of a low kilovoltage. Although visible on the screen, the lines of a Lysholm type grid, being closely adjacent, tend to merge, and are not resolved in the miniature negative.

Lens flare, a great disadvantage in screen photography, can be minimised by proper masking of the lung picture to exclude unwanted bright areas, a rather difficult procedure, but at least all surfaces between screen and lens should be rendered non-reflective. Higher speed fluoride coated lenses giving a much brighter image are promised in the near future.

If at this stage all conditions have been satisfactorily fulfilled, it will be found that *Ilford H.P.X Film* will give the most satisfactory result. All the tones present in the fluorescent image will be faithfully recorded with exquisite definition of lung detail from the periphery to the perihilar regions.

If, however, a compromise has to be made in any one or more of the preceding factors, *Ilford G.X. Film* is recommended. Low power high tension supply is compensated by the greater sensitivity of this film to yellow-green. Loss of contrast due to grid inefficiency or lens flare is balanced by the extra contrast obtainable.

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'Haliverol'

The result of Long and Varied experience in Vitamin research and Vitamin assay.

'HALIVEROL' is a combination of halibut-liver oil and other fish-liver oils with added vitamin D. Although official restrictions have reduced the vitamin potency of 'Haliverol' it is still 32 times as potent as cod-liver oil in vitamin A and 135 times as potent in vitamin D. One minim is equivalent to more than half a teaspoonful of cod-liver oil in vitamin A activity, and to at least 2 teaspoonfuls of cod-liver oil in vitamin D activity.

'Haliverol' provides a markedly active preparation and assures adequate intake of these vitamins without imposing unpalatable medication or altering the dietetic balance.

It is tested and physiologically standardized, and complete reliance may be placed on its vitamin activity.

The Parke, Davis & Co. Laboratories have the benefit of 25 years' experience in vitamin study.

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